APPENDIX 2: SUMMARY OF HAWAII BOTTOMFISH AND SEAMOUNT GROUNDFISH STOCKS (SEPTEMBER 2005)

Summary of Hawaii Bottomfish and Seamount Groundfish Stocks
September 2005

GENERAL BACKGROUND

Bottomfish

- Hawaiian bottomfish are a collection ("complex") of deep slope snappers, groupers, and jacks.
- Fishery features a range of vessel sizes (15-70 feet in length) that fish in deep waters (200-1,200 feet) using vertical handlines (hook and line, not longline or trawls).
- Northwestern Hawaiian Island (NWHI) bottomfish is highly valued in the Hawaii fresh fish market due to larger sizes of fish (for fillets), important for tourism-based restaurants and local cultural holiday activities.
- Fishery has been in operation at various levels since 1913. Currently there are 9 active commercial bottomfish vessels in the NWHI, 325 commercial vessels in the MHI.
- Fishery features minimal finfish by-catch and very few protected resource interactions. The most recent observer placements (2004-2005) did not observe any protected resource interactions. Submersible surveys at two NWHI bottomfishing banks found very little damage that could be associated with fishing activities.
- Imports of snappers and groupers have varied over the years in terms of volume, value, and location. In 2004, using U.S. Customs data, 765,000 pounds ($1,959,000) were imported, most from Tonga (44%), Australia (29%), and New Zealand (18%), compared to a total of 494,600 pounds ($2,177,000) from the Hawaii bottomfish fishery as a whole in 2004.

Bottomfish Stock Status Statistics

	Management Zones			Full Archi-pelago
	MHI	Mau	Ho-omalu	
These are current values in real units.				
2003 CPUE	190	476	488	-
2003 Effort	1628	199	305	-
These are the reference values in real units.				
MSY CPUE	407	470	431	-
MSY Effort	868	208	789	-
These are current values expressed as ratio of the reference values.				
CPUE Ratio	0.47	1.01	1.13	0.82
Effort Ratio	1.88	0.96	0.39	1.13
Full archipelago ratios use weighting factors based on bottomfish habitat in the management zones.				
Weights	0.447	0.124	0.429	-
These are the threshold values for MSST and MFMT.				
MSST (CPUE Ratio)	0.7	0.7	0.7	0.7
MFMT (Effort Ratio)	1	1	1	1

(at CPUE ratios < 0.7, MFMT declines linearly from 1 to 0.)

Definitions:
CPUE = catch per unit effort (pounds per day)
Effort = fishing effort (days)
MSST = minimum stock size threshold, overfished defined as lower than this threshold
MFMT = maximum fishing mortality threshold, overfishing defined as higher than this threshold

Seamount Groundfish

- Seamount groundfish fishery at Hancock Seamounts is distinct from NWHI bottomfish fishery – different species – different locations – different habitat – different gear.
  - A different complex of species (armorhead, alfonsin, and Japanese butterfish)

- Caught with different types of fishing gear (trawls) in deeper waters by distant-water foreign fishing vessels.
- Most of the fishery was in international waters but some fishing was within the U.S. Exclusive Economic Zone (EEZ) at Hancock Seamounts – roughly 150 miles west of Kure Atoll in the far western end of the NWHI.
- Seamount groundfish fishery has been subject to a fishing moratorium since 1986, when the fishery was determined to be over-fished due to over-harvesting by foreign trawlers prior to implementation of the Magnuson-Stevens Fishery Conservation and Management Act (MSFCMA) in 1976.
- No Federal permits were issued to domestic or foreign entities for this fishery.

BOTTOMFISH FISHERY MANAGEMENT

- Managed under the Western Pacific Regional Fishery Management Council's (WPRFMC's) Bottomfish and Seamount Groundfish Fishery Management Plan (FMP). [See http://www.wpcouncil.org/bottomfish.htm]

- 3 bottomfish fishery management zones in Hawaii established to distribute local fishing effort (see Figure 1):
  - All zones include the same multispecies bottomfish stock complex (see Appendix A).

  - **Main Hawaiian Islands (MHI)** – waters surrounding inhabited Hawaiian Islands
    - 80% of MHI fishing grounds are inside State waters. The zone is managed by the State of Hawaii although the WPFMC has made recommendations to the State over time concerning management in the MHI.
    - Unlimited entry; approximately 3,600 vessels are registered with the State of Hawaii to conduct bottomfishing in the MHI. Of these vessels, commercial landings are reported from only 325 vessels. No other licenses or permits are required.
    - Maximum landings occurred in 1988, at 1,166,000 pounds ($3,288,000).
    - Essentially impossible to separate MHI commercial catch into State and Federal portions with the existing data (State of Hawaii catch reports) which record catch in reporting "blocs" which range from 0 to 2 miles, 2 to 20 miles, and 20 miles out.
    - Recreational bottomfish catch data are just now being collected by the cooperative NMFS and State of Hawaii Marine Recreational Fishing Statistics Survey (HMRFSS) intercept creel census program, but few bottomfish fishers have been intercepted by the HMRFSS field staff to date. No estimates have yet been compiled of recreational bottomfish landings in Hawaii.
    - The State of Hawaii and the WPRFMC are also supporting a targeted survey of registered bottomfish fishers to: 1) determine the level of recreational bottomfishing in the MHI; and 2) obtain comments on bottomfish management options for MHI. This survey is on-going.

– **Northwestern Hawaiian Islands (NWHI)**
  - **Mau** zone – a small zone at the eastern end of the NWHI encompassing the islands of Nihoa and Necker. The fishery operates on trips lasting up to 2 weeks).
  - Essentially 100% of habitat in Federal waters.
  - Managed under the WPRFMC's Bottomfish and Seamount Groundfish FMP.
  - 4 vessels had permits to fish in the Mau zone when the zone was established in 1988. Maximum number of vessels was 14 in 1990-1991.
  - In 1999, limited entry program established with 7 vessels participating.
  - Currently, a total of 5 vessels can be permitted and 5 are currently permitted.
  - Maximum landings occurred in 1990 (14 active permitted vessels) at 249,000 pounds ($630,000).

– **Ho'omalu** zone – a larger limited entry zone at the center and western end of the NWHI ranging from French Frigate Shoals to Kure Atoll. The fishery is a distant water fishery and fishing activity is limited by weather and the fresh seafood nature of the fishery.
  - Essentially 100% of habitat in Federal waters.
  - Managed under the WPRFMC's Bottomfish and Seamount Groundfish FMP.
  - In 1987, fishery established with limited entry program; 12 vessels participating at that time.
  - Currently, a total of 4 vessels can be permitted and 4 are currently permitted
  - Maximum landings were in 1992 (5 active permitted vessels) at 353,000 pounds ($1,030,760).

- Other management measures include limitations on vessel size, prohibitions on certain gear types, mandatory catch reporting, and mandatory observer coverage in the NWHI.
- Status of the fishery and stocks is assessed annually, and management measures enacted as deemed necessary.

Despite delineation of these three management zones, Hawaiian bottomfish are evaluated under MSFCMA National Standard 1 guidelines as a single archipelagic-wide multispecies stock complex or population. Management criteria, such as whether the stock complex is overfished or whether overfishing is occurring, apply to the stock complex as a whole population rather than to individual management zones.

However, historically and currently bottomfish population status indicators have been compiled for each of the three zones as a guide to local fishery management.

HAWAII BOTTOMFISH STOCK STATUS

Historical Stock Status and Trends

- Fishery status was evaluated based on a species-specific 20% SPR threshold (spawning potential ratio, an index of the reproductive capability of the stock), from 1986-2003. Species-specific SPR values were reported for the archipelago, as well as individual zones,

but stock status was determined at the archipelago level. While there are limitations to the SPR approach, it was the best available method for tracking year-to-year changes in the fishery until mid-2003 when the revised National Standard 1 guideline approach was put in place.

- Under the SPR approach:
  - No stocks of bottomfish in the Hawaiian archipelago were overfished. However, in the MHI, *ehu* and *onaga* populations were reported to be locally depleted. This led to a suite of State of Hawaii regulations in 1998, including recreational bag limits and 20 closed areas throughout the MHI.
  - In the NWHI, local depletion was not reported for any species. SPRs were well above 20% for all species.

Based on the SPR measures, the bottomfish stock complex was <u>not</u> overfished in any year from 1986 to 2003.

<u>Current Stock Status</u>

- After mid-2003, under the new MSFCMA National Standard 1 guidelines, "overfishing" and "overfished" definitions were established for the Hawaii bottomfish fishery. Hawaii bottomfish are assessed as a single archipelagic multispecies stock complex for these purposes, however the status of bottomfish in each of the 3 zones continues to be assessed annually to facilitate effective conservation and management decision making.
- National Standard 1 guidelines define:
  - Overfishing -- too much fishing (relative to fishing mortality at maximum sustainable yield (MSY)); we use fishing effort (expressed as days fished) as a proxy for fishing mortality and assess overfishing annually by comparing the current overfishing metric to an established threshold (maximum fishing mortality threshold (MFMT)) for bottomfish.
  - Overfished -- not enough fish (relative to biomass at MSY); we use catch per unit effort (CPUE) expressed as pounds caught per day as a proxy for abundance; overfished status is determined annually by comparing the current overfished metric to an established threshold (minimum stock size threshold (MSST)) for bottomfish.
- Under the National Standard 1 guidelines:
  - The Hawaiian bottomfish stock is **not** overfished (the *biomass* standard); however, overfishing (the *fishing* mortality standard using fishing effort as a proxy) is occurring as reported in the 2003 annual report of the WPRFMC and in the 2004 NOAA Fisheries Status of Stocks report to Congress [http://www.nmfs.noaa.gov/sfa/domes_fish/index.htm].
  - The WPRFMC is currently developing options within its Bottomfish and Seamount Groundfish FMP to address this situation. Under the MSFCMA, the WPRFMC has one year to develop a plan to address this overfishing concern.

In summary:

> **Based on nationally- and legally-accepted definitions, in 2003, overfishing <u>was</u> occurring on the Hawaii bottomfish stock complex on an archipelagic basis but the bottomfish stock complex <u>was not</u> overfished, i.e., sufficient biomass remained. Further, as reported below, this over-fishing situation is reflected by the situation in the MHI, not the NWHI.**

<u>Projected Stock Status and Trends</u>

- **Archipelago-wide trends:**
  - The fishing mortality ratio indicator (i.e., fishing effort) for the archipelago has experienced significant fluctuations; since 1998 it has continually declined (see Figure 2).
  - The biomass ratio indicator for the archipelago has manifested a more stable trend with no significant change (see Figure 2).
  - Mean weights for individual fish are declining, which is expected with fishing; however, mean weights in both NWHI zones remain significantly higher than those in the heavily fished MHI. Alternative explanations exist for changes in captured fish size, such as gear configuration, gear competition, size targeting, fishing location, and fishing ability. Anecdotal information from fishermen and submersible observations of size/age related segregation of fish over the fishing grounds tend to confirm that weights are associated with fishing style.
  - Trends in landings of particular species are not used as a measure of abundance or fishery health because landings of one species can change dramatically with species targeting, market incentives, gear competition, or natural changes in the ecosystem. Good examples are the pig-lipped *ulua* (*butaguch,* a jack) and *uku (*a grey snapper*)*, which are targeted at various times of the year in response to seasonal fluctuations in demand.

- Trends in the **MHI** (see Figure 3)
  - CPUE in the MHI is relatively stable over the past decade.
  - Since 1998, reported commercial fishing effort in the MHI zone has declined by 50%; commercial participation also has declined.
  - Because of the overfishing status of the Hawaii bottomfish fishery, the WPRFMC is currently evaluating effort reduction alternatives in the EEZ portion of the MHI.

- Trends in the **Mau Zone** (see Figure 4)
  - CPUE in the Mau zone was relatively stable over the past decade but has been increasing in recent years as participation has dropped.
  - Participation in the Mau zone has declined by approximately 70% from 14 vessels in 1990 to 5 vessels in 2003 as anticipated under the limited entry system.
    - Participation is capped at current participants (however, regulatory changes have been proposed by the WPFMC to enable new Mau zone entrants)
    - Further attrition is anticipated due to current use-or-lose permit policy and the on-going uncertainty in the status of the NWHI fishery under the Executive Order.

  - Significant restrictions in or closure of the Mau zone bottomfish fishing grounds are expected to concentrate effort in open areas, possibly causing further depletion in the MHI.

- Trends in the **Ho‘omalu Zone** (see Figure 5)
  - CPUE has declined over time as consistent with a sustainable fisheries population dynamics model.
  - Since 1990, participation has remained fairly constant, while effort has fluctuated and shows no discernible trend.
  - Significant restrictions in or closure of the Ho‘omalu zone bottomfish fishing grounds would be expected to concentrate effort in open areas, possibly causing increased depletion in the MHI.

DATA AND METHODOLOGY

Stock Assessment Data Sources and Data Collection Frequency

- PIFSC scientists conduct bottomfish biological stock assessments annually; these assessments are conducted under “data poor” conditions. Data poor refers to the quantity of data, not quality, and suitable assessment methodologies are available for application under such conditions.
- From 1984 to 1990, NMFS relied on shoreside monitoring at the Honolulu auction to estimate catch per trip and to track fishing effort (number of trips).
- Currently, PIFSC uses two sets of State of Hawaii commercial fishery-dependent catch data:
  - Fishing “bloc” data compiled per vessel per day for the MHI
  - Logbook data for the NWHI (available since 1991)
- From1984-1990 PIFSC utilized shoreside monitoring to compile size composition and other biological and economic information from the NWHI; recently electronic data reporting through Honolulu seafood dealers has come on-line and is available for this purpose.
- The results of the stock assessments are presented to the WPRFMC’s Bottomfish and Seamount Groundfish plan team for review and compiled in an annual report by the WPRFMC (see http://www.wpcouncil.org/bottomfish.htm #AnnualReports)
- The most current annual report is for the data year 2003. Data for 2004 are currently being compiled and evaluated.

Data and Methodology Uncertainties, Gaps, Needs

- To date, NWHI CPUEs have been reported in terms of catch per day and have not been standardized by vessel fishing power
  - NWHI fleets are extremely small (5 vessels in the Mau zone and 4 vessels in the Ho‘omalu zone). Entry or departure of one or more vessels can greatly influence the overall fishing performance of the fleet, the resultant CPUE, and as a result, estimates of biomass based on those CPUEs.
  - As a result, current CPUEs in this very small and very specialized handline fishery may be related more to fishing ability or skill, rather than fish abundance; careful standardization of commercial catch data is necessary prior to interpretation

- CPUE data at the line-hour level (optimal) for each NWHI vessel can be generated from 1997 to the present from new State of Hawaii logbook
- PIFSC staffers have developed algorithms to incorporate this improved data and will have results by November 2005 to use these new measures in calculating National Standard 1 reference points

- In January 2004, a Bottomfish Stock Assessment Workshop was held in Honolulu co-sponsored by the WPFMC and PIFSC, bringing together an ***independent scientific panel*** of stock assessment experts
  - The objective of the workshop was to evaluate the existing bottomfish data and stock assessment techniques and make recommendations for future assessments
  - Some of the recommendations included:
    - Collect biological data such as length, weight, sex, maturity, and age for key species in order to update important life history parameters
    - Implement a tagging program to determine the extent of movements
    - Initiate a routine fishery-independent survey to provide unbiased estimates of abundance (biomass)
    - Apply several stock assessment models to the data
    - If feasible, create an operational model of the fishery
    - Assess the extent of spatial structuring in Hawaiian bottomfish populations and incorporate this complexity in future assessment and management models

  - The results from this workshop are in the midst of being implemented with the assistance of independent academic stock assessment experts under contract to PIFSC who will: 1) evaluate existing bottomfish data collection programs and if necessary provide recommendations to enhance these programs; and 2) advance population modeling and stock assessment methodologies through the incorporation of spatial structure and ecosystem principles

- In the future, PIFSC will be conducting a three-stage peer-reviewed process to development of significant stock assessments: 1) a detailed review and "certification" of the available data; 2) evaluation and testing of the stock assessment models and assumptions; and 3) review of stock status and implications. This will require more formality in the stock assessment process, and as a result, lengthier time-frames until the new procedures are routinized.

-- Compiled by PIFSC fishery biology staff, September 2005, from public information sources

Glossary:

CPUE – Catch per unit effort, an index of fishing performance often utilized as a measure of fish abundance, after careful standardization.

EEZ -- Exclusive economic zone, generally the region 3 to 200 miles offshore.

FMP – federal Fishery Management Plan.

HMRFSS – Hawaii Marine Recreational Fishing Statistics Survey.

MHI – Main Hawaiian Islands, the inhabited islands in the lower portion of the Hawaiian Archipelago (Middle Bank, Niihau, Kauai, Oahu, Molokai, Kahoolawe, Maui, Lanai, Hawaii).

MFMT – Maximum fishing mortality threshold, a reference point for overfishing status in the NMFS National Standard 1 guidelines, values higher than this threshold are overfishing by definition.

MSFCMA – Magnuson Stevens Fishery Conservation and Management Act (1976 as subsequently amended).

MSST – Minimum stock size threshold, a reference point for overfished status in the NMFS National Standard 1 guidelines, values lower than this are overfished by definition.

MSY – Maximum sustainable yield, a reference point in fisheries describing a degree of resource utilization which allows maximum removal while ensuring long term sustainability.

NWHI – Northwestern Hawaiian Islands, the portion of the Hawaiian Archipelago stretching from Nihoa to Hancock Seamount.

PIFSC – NOAA Fisheries Pacific Islands Fisheries Science Center

SPR – Spawning potential ratio, a stock assessment index related to the reproductive health of a stock, no longer utilized by NMFS as a measure of “overfished” status, but remains an important stock indicator and remains in the Control Rule as a second (species specific) layer.

WPRFMC – Western Pacific Regional Fishery Management Council, the policy-making organization for the management of fisheries in the EEZ around the Territory of American Samoa, Territory of Guam, State of Hawaii, the Commonwealth of the Northern Mariana Islands, and US Pacific island possessions.

Convenient information sources

Pacific Islands Fisheries Science Center

http://www.pifsc.noaa.gov/

NOAA Fisheries Office of Sustainable Fisheries

http://www.nmfs.noaa.gov/sfa/domes_fish/index.htm

Western Pacific Fishery Management Council

http://www.wpcouncil.org/

Figure 1. Map of Hawaiian Archipelago showing location of bottomfish management zones.

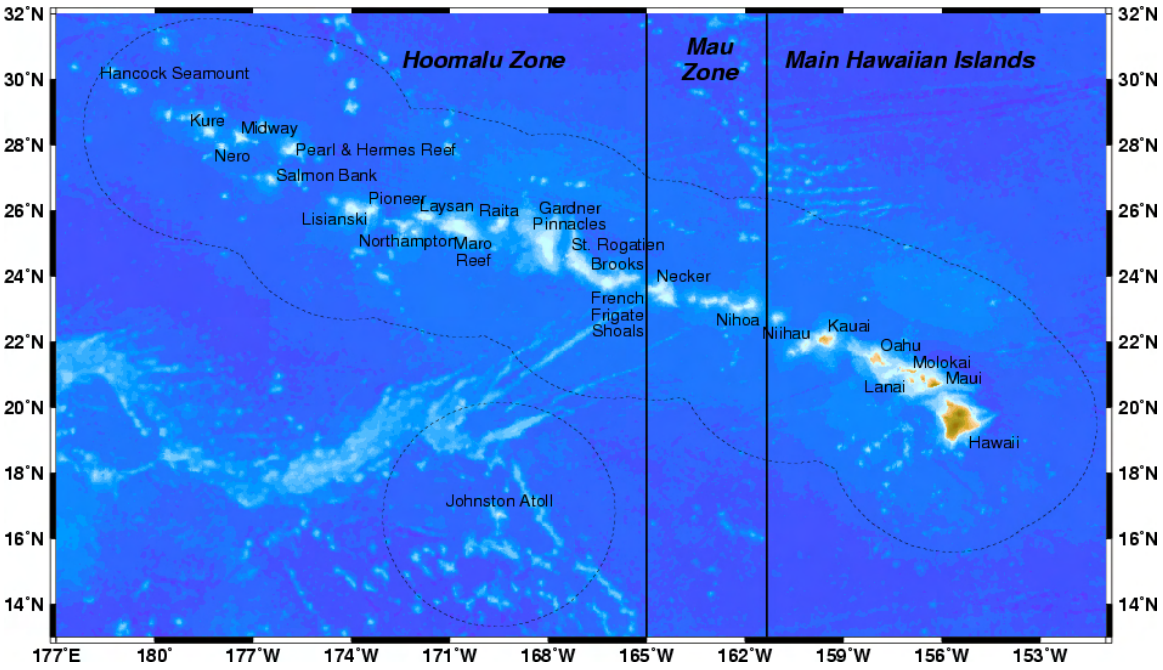


Figure 2. Hawaii bottomfish effort and biomass ratios (archipelago-wide, including all management zones).

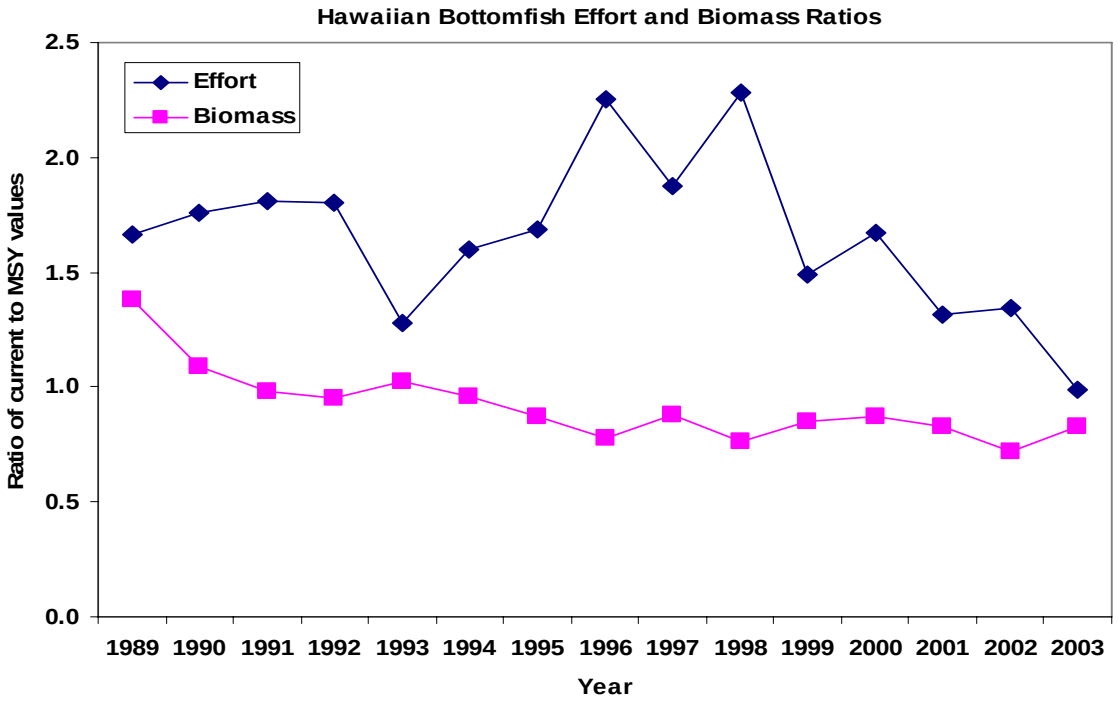


Figure 3. MHI zone fishery time series [nominal data]

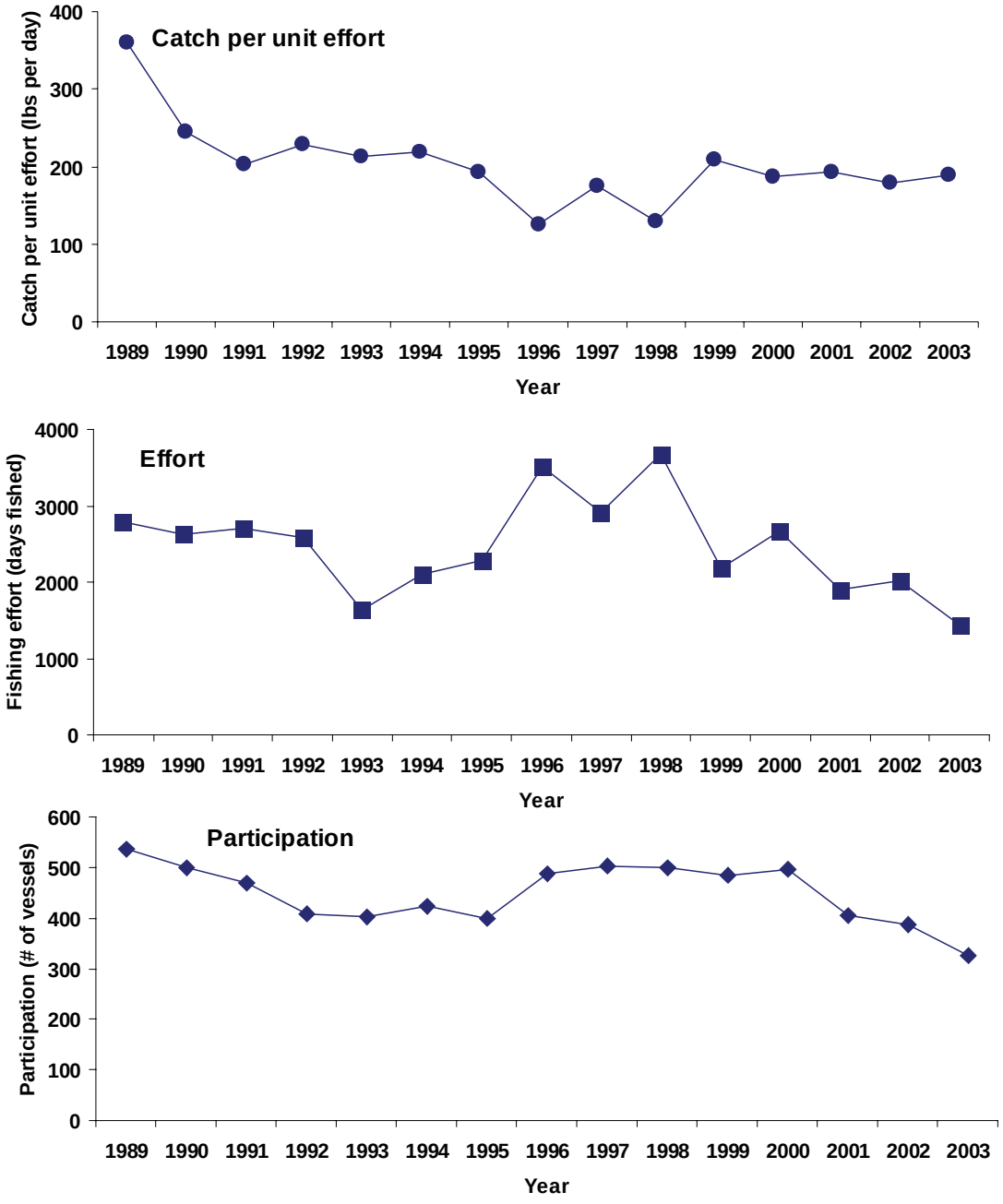


Figure 4. Mau zone fishery time series [nominal data]

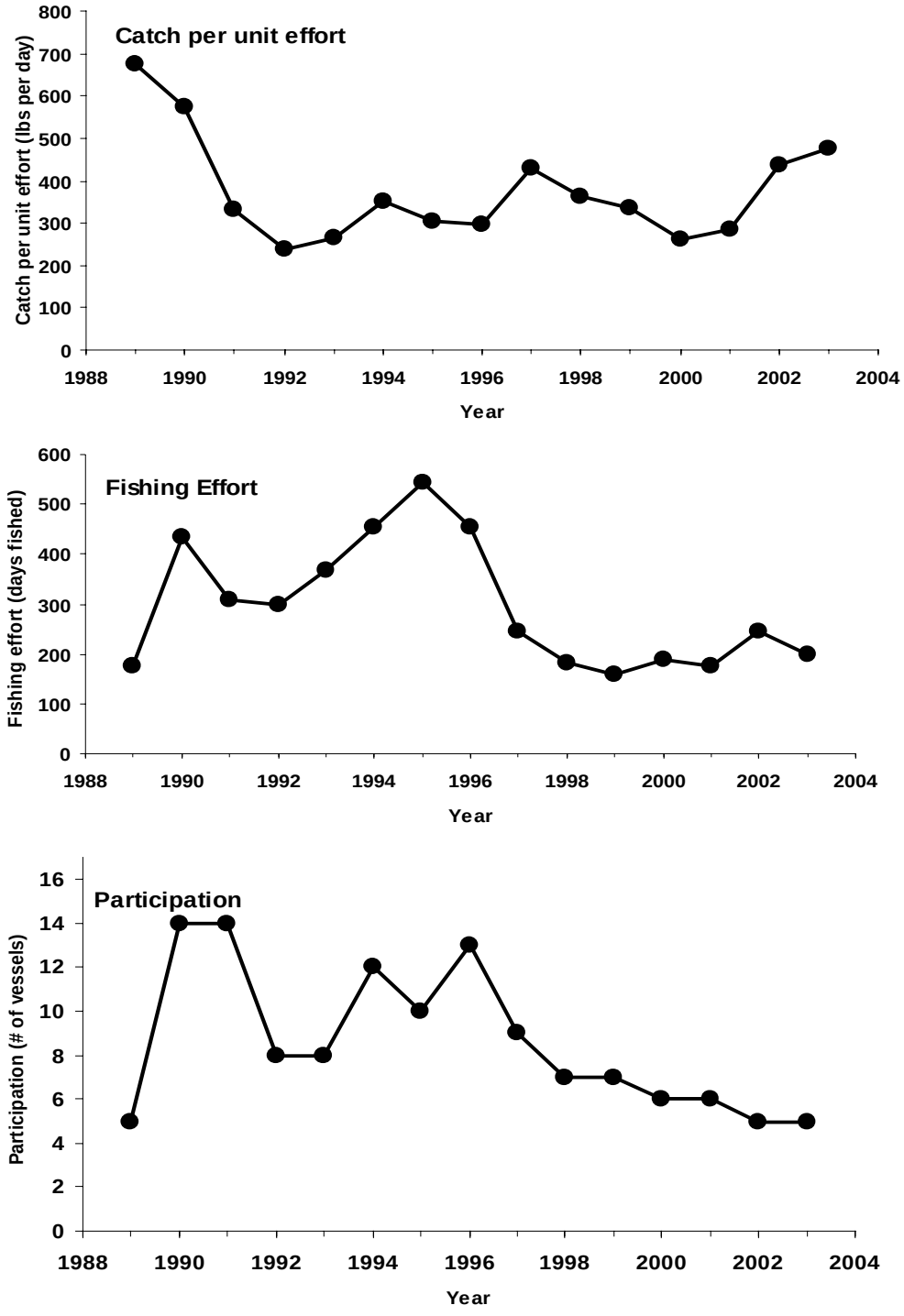
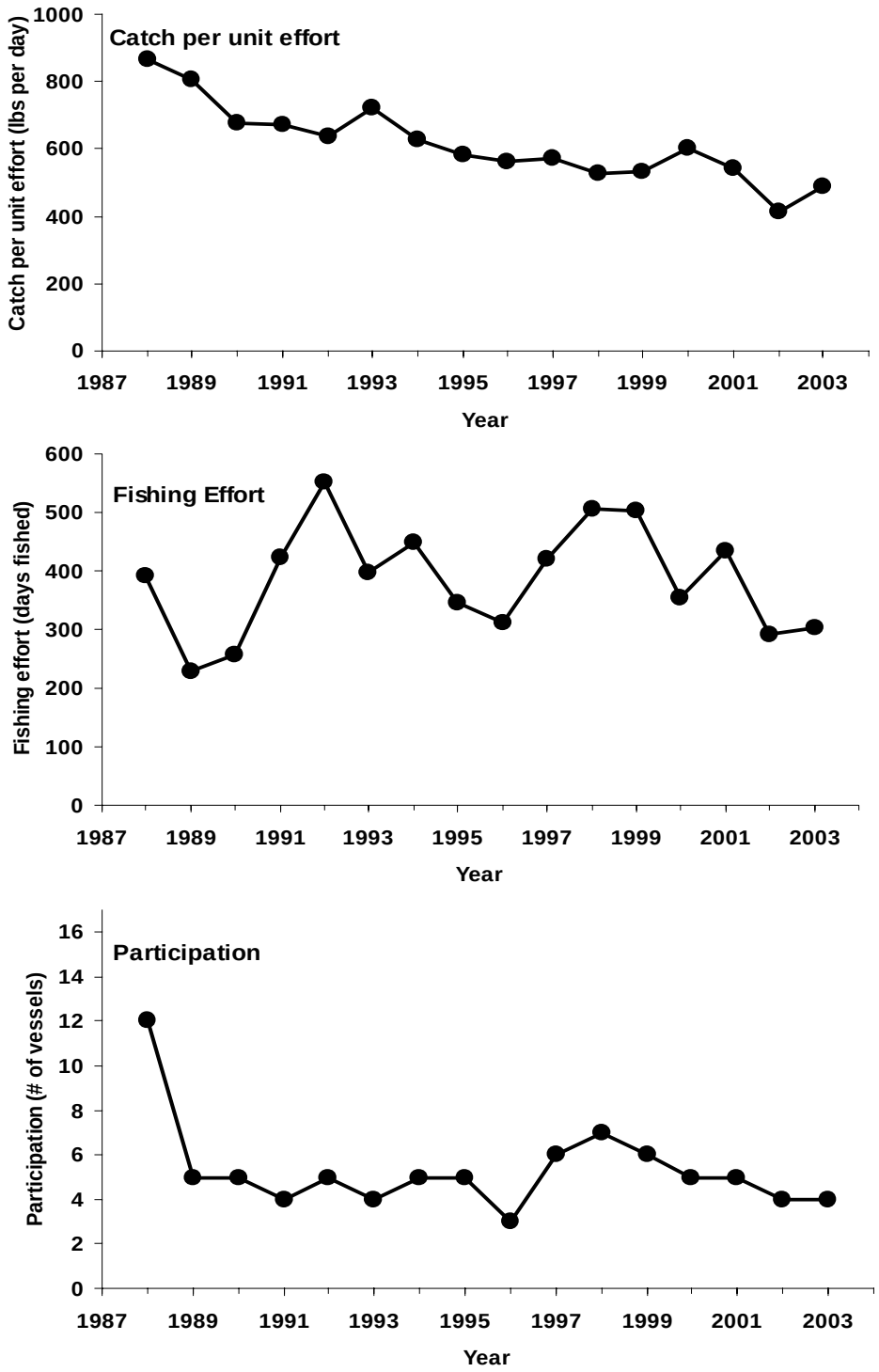


Figure 5. Ho‘omalu zone fishery time series [nominal data]

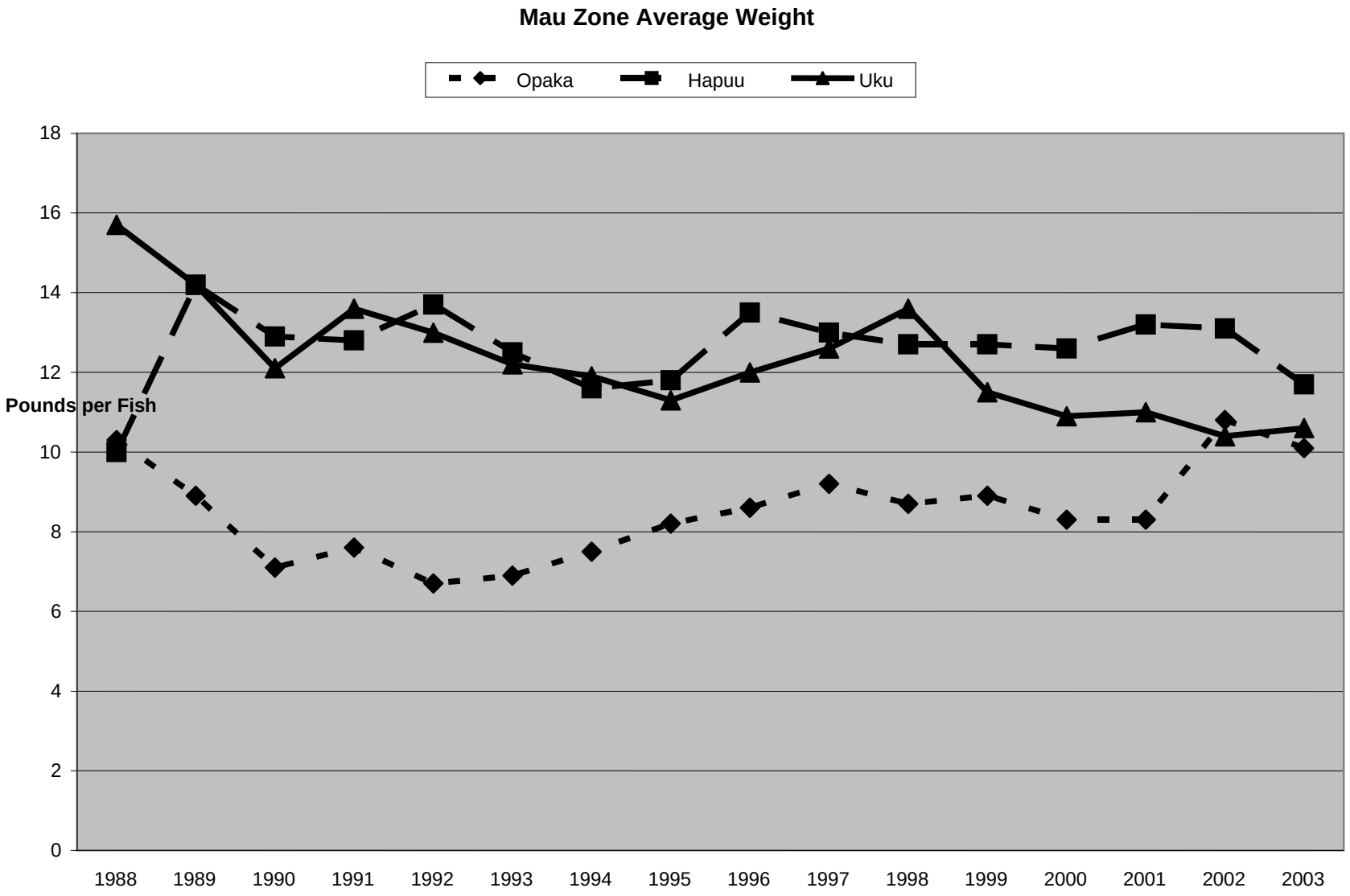


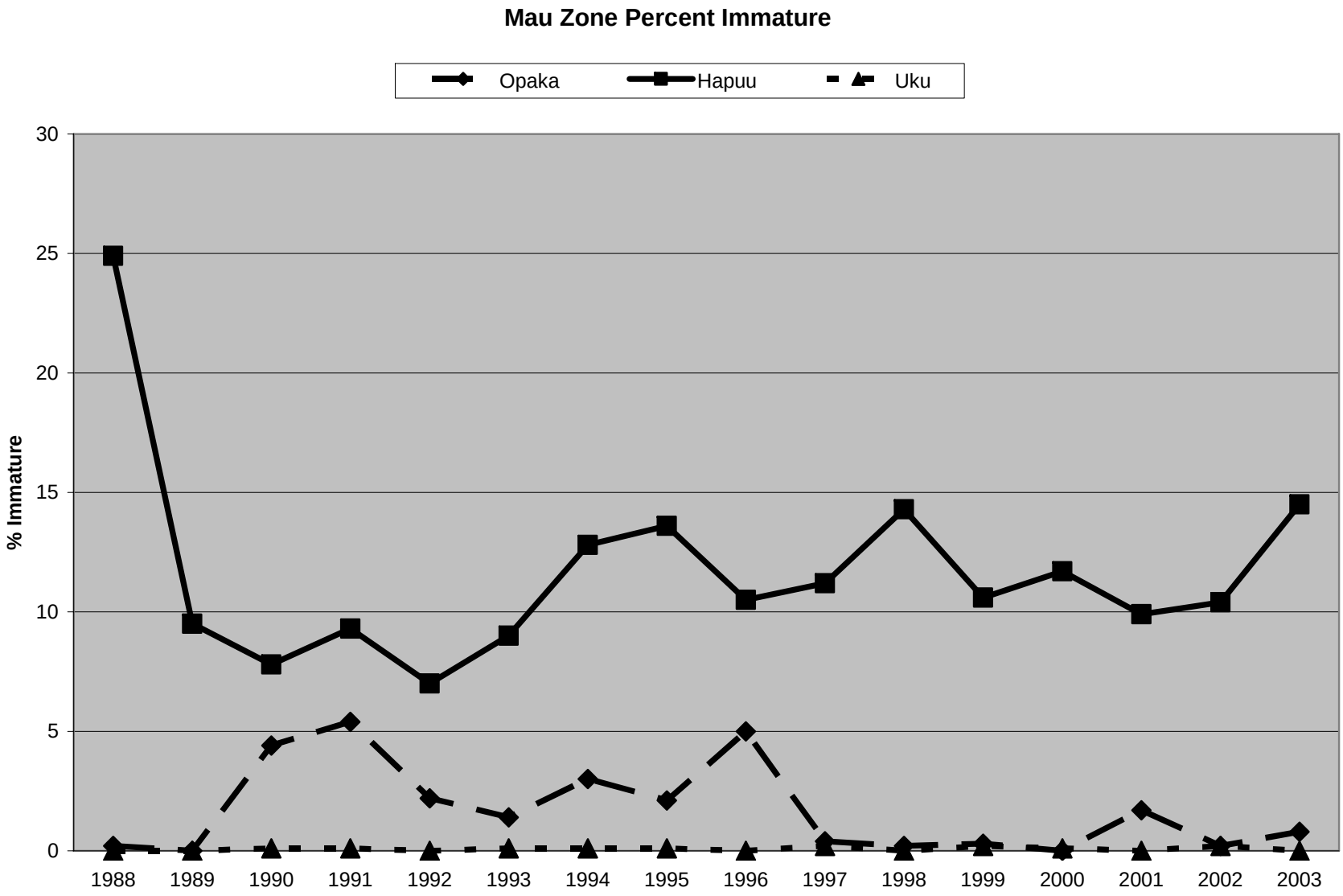
Appendix A: Hawaii Bottomfish and Seamount Groundfish Species

Scientific	English Common	Hawaii Common
Bottomfish:		
Aphareus rutilans	red snapper/silvermouth	lehi
Aprion virescens	gray snapper/jobfish	uku
Caranx ignobilis	giant trevally/jack	white ulua/pau'u
C. lugubris	black trevally/jack	black ulua
Epinephelus fasciatus	blacktip gouper	
E. quernus	sea bass	hapu'upuu
Etelis carbunculus	red snapper	ehu
E. coruscans	red snapper	onaga
Lethrinus amboinensis	ambon emperor	
L. rubrioperculatus	redgill emperor	
Lutjanus kasmira	blueline snapper	ta'ape
Pristipomoides auricilla	yellowtail snapper	yellowtail kalekale
P. filamentosus	pink snapper	opakapaka
P. flavipinnis	yelloweye snapper	yelloweye opakapaka
P. seiboldi	pink snapper	kalekale
P. zonatus	snapper	gindai
Pseudocaranx dentex	thicklip trevally	butaguchi/pig ulua
Seriola dumerili	amberjack	kahala
Variola louti	lunartail grouper	
Seamount Groundfish:		
Beryx splendens	alfonsin	kinmedai (Japanese)
Hyperoglyphe japonica	ratfish/butterfish	medai (Jap.)
Pseudopentaceros richardsoni	armorhead	kusakari tsubodai (Jap.)

Representative Summary Statistics from the NWHI Mau Zone

2 figures attached based on data from the WPFMC annual reports


Mau Zone Average Weight
Opaka
Hapuu
Uku
Pounds per Fish
18
16
14
12
10
8
6
4
2
0
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003


Mau Zone Percent Immature
Opaka
Hapuu
Uku
% Immature
30
25
20
15
10
5
0
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003